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# The impact of unofficial out-of-pocket payments on satisfaction with education in Post-Soviet countries

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ABSTRACT

The purpose of this study is to determine the impact of unofficial out-of-pocket payments on satisfaction with education in the countries of the former Soviet Union and Mongolia. Linear IV indicates that out-of-pocket payments weaken satisfaction by a factor of −0.98, while biprobit indicates that out-of-pocket payments lessen satisfaction by 0.29 percentage points. At the same time, the interaction model demonstrates that the negative impact of paying unofficial out-of-pocket payments declines as quality of education improves. As quality of education deteriorates, the negative impact of paying unofficial out-of-pocket payments grows considerably.



## 1. Introduction

In public service delivery, including public education, the feedback of citizens is a key indicator with respect to the quality and efficiency of services delivered (Babajanian, 2015; Deichmann and Lall, 2007; Poister and Henry, 1994). However, the purpose of feedback is not only to evaluate the performance of service providers, but also to ensure that providers become user-oriented (Diagne et al., 2012; Ravindra, 2004). In addition, holding government accountable through feedback is increasingly recognized as a vital way to enhance service delivery, build the capacity of civil society, foster the culture of transparency in governance, and accomplish the long-term objective of socio-economic development (McNeil et al., 2009). Finally, the provision of feedback also affords citizens valuable opportunities through which to influence the decisions that affect their lives, and becomes a promising mechanism through which to increase their empowerment (Stern, 2002).

Against this backdrop, with respect to the importance of satisfaction, the aim of this paper is to evaluate the impacts of unofficial out-of-pocket payments (henceforth OOP) with respect to satisfaction with primary and secondary schooling in the countries of the former Soviet Union and Mongolia (henceforth FSU). Many incidences of OOP in these countries can be qualified as outright corruption (Heyneman, 2010, 2011). The classic definition of corruption in education is defined as "the abuse of authority for personal as well as material gain" (Heyneman, 2004; p. 1). Reasons for paying OOP can include paying education officials to have children admitted to a good school, unofficial tutoring, and payments for better grades and course work (Briller, 2007; OECD, 2004). Overall, OOP incidents are widespread in FSU countries. For instance, in Russia, OECD (2004) reported that approximately half the parents of schoolchildren paid OOP to get their children accepted to a better school.

In contrast, in transitional countries, other types of OOP lie beyond the classic definition of corruption since they do not necessarily involve the private gain of public officials. Examples of such incidents involve purchasing school supplies, payments for redecoration, refurbishment, and equipment and class materials including textbooks (OECD, 2004). In these cases, the education officials may not receive any direct benefits from the OOP. Rather, OOP substitutes for funding from the state budget. The high incidences of unofficial OOP for these purposes are hardly surprising given the chronic shortages of funds for education in state budgets in FSU countries. In Tajikistan, for example, 75% of schools work in two shifts to cope with the lack of school places, and only 30% of students are able to obtain a full set of required textbooks. Furthermore, teachers are paid very low salaries and lack support in the classroom, thus forcing students, teachers,

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and educational administrators to rely on OOP (Briller, 2007; UNICEF, n.d.). Even in better-off Russia, 37% of public schools require major repairs, while only 59% of schools have a proper sewage system (OECD, 2004).

In addition, it is not often possible to distinguish between the two above-described types of OOP. For example, a teacher may ask parents to pay for class refurbishment, something that officially should be paid by the school budget. The teacher may use all the money collected for refurbishment. Alternatively, they may use only part of the money collected for refurbishment, and take another part for themselves personally. Finally, the teacher may take all collected money for themselves, knowing that the refurbishment will be paid for by the school budget. Since it is not possible to clearly distinguish between these different types of OOP, in this paper we consider all OOP as one single phenomenon that encompasses paying for educational services which should have been provided for free (Diagne et al., 2012).

Two dominant perspectives are identified within the literature with respect to OOP. The first perspective is that in education, OOP is a negative phenomenon. This perspective is in line with the "sand-the-wheel" hypothesis in the literature of political science and economics, and is supported by international development organizations such as the UN, IMF, and World Bank (Aidt, 2003, 2009). If students believe that success in education is the result OOP rather than personal efforts, it undermines their efforts to gain and maintain human capital in an honest way instead of relying on unofficial payments (Heyneman, 2004, 2008; Transparency International, 2013). It is not surprising then that paying OOP is associated with lower learning outcomes (Azfar and Gurgur, 2008). Moreover, OOP reinforces the existing inequality in society. The children of wealthier parents receive a better-quality of education, while those of poorer parents do not have the opportunity to receive it (Transparency International, 2013; UNICEF, 2007). In addition, paying OOP for services that should be provided for free reduces citizens' trust in the educational system, undermines social justice, weakens social cohesion and solidarity in society, and thus in turn hinders economic development and leads to political instability (Heyneman, 2000, 2002, 2004). Consequently, according to the "sand-the-wheel" perspective with respect to OOP, we should expect to see a negative impact of OOP on satisfaction with education.

The second perspective is that OOP are an important instrument through which to alleviate distortions caused by the inefficiencies of weak institutions. This perspective is in line with the "grease-the-wheel" hypothesis in the political sciences and economics literature (Dreher and Gassebner, 2013; Leff, 1964). Méon and Wheil (2010, p. 244) suggest that "the 'the grease-the-wheels' hypothesis states that, in a second best world, graft may act as a trouble-saving device, thereby improving efficiency." The positive impacts of OOP in mitigating the inefficiencies of a centrally-planned economy are well-documented in the literature (Holmes, 2000; Levy, 2007; Nye, 1967). Every parent wants to see their child achieve success in getting the best possible educational outcomes (Heyneman, 2004). Hence, it is possible to assume that parents who pay OOP may be more satisfied if their children study under better classroom and school conditions, receive higher grades, obtain all required textbooks, and are accepted in better schools. Indeed, the positive impact of OOP on satisfaction with pubic services, including education, has been reported in many developed countries. Thus, Bratton (2007) has found that paying unofficial OOP is associated with increased satisfaction. A similar conclusion was reached by Lavallée et al. (2008) who found that the impact of paying OOP was positive when the quality of received public services had improved. Bratton (2007, p. 60) explains the positive impact of OOP on satisfaction with public services by stating that "paying [OOP] opens the door to services that are otherwise scarce and inaccessible." As a result, according to the "grease-the-whee" perspective, we should expect to see a positive impact of OOP on satisfaction with education.

The straightforward approach to estimating of the impact of OOP on satisfaction with education is to regress satisfaction with respect to OOP while controlling for the influence of covariates. This approach can be implemented by a single-stage regression (e.g. OLS and probit). This approach however, is problematic due to the endogeneity that leads to reverse causality and omitted variable biases. To address reverse causality and omitted variable biases, we use instrumental variable models in addition to single-stage models. Below, we will consider the details of reverse causality and omitted variable biases, and the ways to address them.

Recall that both the "sand-the-wheel" and "grease-the-wheel" perspectives postulate that paying OOP may affect satisfaction. At the same time, it is reasonable to believe that satisfaction may affect OOP inasmuch as higher satisfaction may reduce the number of OOP incidences. Indeed, public institutions that elicit higher levels of satisfaction may encourage prosocial behaviors and reduce unofficial OOP by assuring citizens that all cases of OOP will be effectively prosecuted (Andriani and Sabatini, 2015; Irwin, 2009; Treisman, 2000; Uslaner, 2004). In addition, individuals who are satisfied with the education services received are less likely to be involved in or tolerate OOP (Ariely, 2011; Harding, 2013; Marien and Hooghe, 2011). Finally, higher levels of satisfaction with public services are typically associated with higher living standards, then result in fewer incidents of criminal behavior, including corruption (Kubbe, 2014). Thus, the provision of unofficial OOP and the resulting satisfaction creates a loop of causality where both variables have simultaneous effects on each other. Such a loop of causality leads to reverse causality in single-stage regression models. The results of single-stage models are biased if reverse causality is present. In contrast, instrumental variable models highlight the true direction of the impact and adjust the results to the presence of reverse causality (Baum, 2006; Cameron and Trivedi, 2010).

Omitted variable bias is another serious problem that cannot addressed by single-stage regression models. This problem arises in the presence of some unobserved characteristics that can simultaneously affect both outcome and impact variables. For instance, transparency in school management may simultaneously increase satisfaction and at the same time may reduce unofficial OOP (Lewis and Pattinasarany, 2009). Likewise, effectively uncovering and prosecuting unofficial OOP cases may simultaneously increase satisfaction while reducing the likelihood of OOP payments. The single-stage regressions cannot account for omitted variable problems that lead to biased results. In contrast, instrumental variable models address the omitted variable bias and adjust the results of estimations accordingly (Wooldridge, 2002).

To summarize, we evaluate the "sand-the-wheel" and "grease-the-wheel" perspectives with respect to the impact of OOP on satisfaction with education. To adjust for possible endogeneity that may lead to reverse causality and omitted variable biases, we estimate both single-stage and instrumental variable regressions. With this in mind, let us now turn to a discussion of the study's materials and methods.

## 2. Material and methods

### 2.1. Data

This study relies on the 2010 Life in Transition Survey (henceforth the LITS) that was conducted jointly by the World Bank and the European Bank for Reconstruction and Development

(Ipsos, 2011). In this paper we focus on the FSU countries, which include: Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, the Ukraine and Uzbekistan. Mongolia is also included in our sample although it was not formally a part of the former Soviet Union. The advantage of the LITS is that it provides high quality information about satisfaction with primary and secondary education, incidents of OOPs in schools, and the socio-economic characteristic of respondents. Approximately 1000 respondents were selected randomly in each country using a multistage clustered sampling method. In each country, between 50 or 75 clusters were selected based on the probability proportional to size technique. Within each cluster, households were selected to be interviewed based on a systematic random sampling technique. Finally, within households, the respondent was selected for interview through the use of random order number (Ipsos, 2011).

### 2.2. Outcome and impact variables

The outcome variable is citizen satisfaction with the quality and efficiency of public education (primary and secondary). The LITS survey asked respondents to rate their satisfaction on an ordinal scale from "very unsatisfied" to "very satisfied". Only those respondents who had utilized public primary or secondary education during the last 12 months before the date of the survey were asked to answer this question.

The impact variable is having paid OOP in primary and secondary schools. The LITS asked respondents whether they had paid an unofficial OOP or made a gift while utilizing a primary and/or secondary school in the last 12 months. This variable is binary: if respondents had paid an unofficial OOP or made a gift, then the paid OOP variable takes a value of 1; otherwise it takes a value of 0.

The difficulty inherent in analyzing outcome ordinal variables and binomial predictors in the framework of instrumental variables is that such a model has not yet been well worked out in the literature and has not been well implemented in standard software packages, especially in terms of the required tests for instrumental variables (Lewis and Pattinasarany, 2009). Thus, contemporary literature suggests two main ways to use the instrumental variable approach when the outcome variable is ordinal and the predictor is binomial. First, the ordinal outcome variable can be treated as a continuous variable and a linear instrument variable regression, and a so-called IV model, can be then estimated (Kim et al., 2011). Second, the ordinal outcome variable can be recoded into a binary variable "satisfied with public education" versus "not satisfied with public education," and an instrument variable probit regression model, a so-called biprobit, can then be estimated (Lewis and Pattinasarany, 2009). In this paper, we use both suggested approaches to increase the robustness of our findings. Therefore, our first outcome variable is "citizen satisfaction" as a continuous variable with a five-point scale that has been taken directly from the LITS. In contrast, the second outcome variable is binary, and takes a value of 1 if the respondent is satisfied or very satisfied with public education, otherwise it takes a value of 0. Descriptive statistics for all discussed variables are reported in Table 1.

The first graph in Fig. 1 illustrates the relationship between satisfaction and OOP and gifts, using satisfaction as a continuous variable. The graph plots average satisfaction per country with the proportion of people who reported paying unofficial OOP in primary and secondary schools. As observed, higher incidents of such payments correlated with lower satisfaction. This visual observation is empirically supported by the Pearson correlation ($r = -0.79$).

The second graph in Fig. 1 depicts the relationship between satisfaction and unofficial OOP and gifts using satisfaction as a binary variable. The graph plots the proportion of satisfied respondents per country with the proportion of people who reported paying unofficial OOP and gifts in primary and secondary schools in the countries of the FSU. Again, visual observation demonstrates that higher numbers of incidents of such payments are correlated with lower levels of satisfaction. This visual observation is confirmed by the Pearson correlation ($r = -0.60$). These findings provide us with an initial understanding of the association between higher OOP and lower satisfaction with education.

### 2.3. Analytic strategy

We begin by estimating classic single-stage OLS and binary probit models. Next, we estimate IV and biprobit. Hence, linear single-stage OLS is compared with an IV, while probit is compared with biprobit. Conceptually, the IV model consists of two regression models – the so-called first and the main stages, although popular software packages typically derive the results in a single step. In the first stage, the impact variable, unofficial OOP, is regressed on the instrument and all covariates using OLS. In the main stage, the outcome variable, satisfaction with primary and secondary education is regressed on the predicted value of unofficial OOP from the first stage equation and all covariates. The IV models are estimated using the *ivregress* command in Stata 13. Similar to the IV approach, the biprobit requires two binomial probit equations. The first one is used to regress the impact variable on the instrument and all covariates, while the second one is used to regress the outcome on the impact variable and covariates. Biprobit fits both probit equations simultaneously using a maximum-likelihood approach to find the joint probability of being satisfied with education and having paid unofficial OOP. Biprobit is estimated using the *biprobit* command in Stata 13.

The estimation of IV and biprobit models requires instruments that are strongly correlated with the impact variable and should not have a direct effect on the outcome variable other than through the impact variable. Finding such a variable is a difficult task, but we benefitted from the feature of the LITS that asked a follow-up question regarding whether respondents had paid OOP because they had been asked to directly by educational officials. This question was asked only from those respondents who had suggested that they had paid OOP. Alternative reasons for paying OOP indicate the initiation of OOP by the respondent, and this could have occurred because: the respondent was not asked, but had made a gratitude payment; the respondent was not asked but knew that OOP had been expected; the respondent paid to get what they wanted in a better and more efficient fashion.

Consequently, we use the binomial variable "Asked to pay unofficial OOP" that indicates whether or not OOP was paid because educational officials had directly asked the respondent to pay it as the instrument in this study. The link between the instrument, the predictor, and the outcome is illustrated graphically in Fig. 2. As shown, the instrument "Asked to pay unofficial OOP" is not related to satisfaction other than through the impact variable, while the instrument "Asked to pay unofficial OOP" is strongly correlated with the impact variable.

Let us begin with the first postulate that the instrument, "Asked to pay unofficial OOP," is not related to satisfaction other than through the impact variable. On the one hand, satisfaction is unlikely to influence the decision to ask for OOP, since the decision to ask for an OOP does not originate with the respondent but with the educational officials (Clausen et al., 2011). It is implausible that the educational officials knew about of respondent's level of satisfaction before asking them to pay unofficial OOP. It is even less implausible that the educational officials made a decision about

**Table 1**
Variable definitions and descriptive statistics.

| Variable | Definition | Average | % | Std. dev. | Min | Max |
|---|---|---|---|---|---|---|
| *Outcome variables* | | | | | | |
| Satisfaction with primary and secondary 1 | Satisfaction with primary and secondary school measured on an ordinal scale from 1 = "very unsatisfied" to 5 = "very satisfied". This variable serves as an outcome variable in estimations by linear single-stage and instrumental variable regressions—OLS and IV, respectively. | 3.578 | | 0.925 | 1 | 5 |
| Satisfaction with primary and secondary 2 | Binary variable that takes value of 1 if respondent is satisfied with primary and secondary school, otherwise it takes a value of 0. This variable serves as an outcome variable in estimations by binomial single-stage and instrumental variable regressions—probit and bivariate probit, respectively. | | 69% | 0.005 | 0 | 1 |
| Service delivery | | | | | | |
| Quality of education | A summative index indicating the number of problems encountered while interacting with primary and secondary schools in last 12 months. The higher value of the index indicates less problems and, hence, higher quality. | 0.852 | | 1.108 | 0 | 5 |
| Socio-demographics | | | | | | |
| Age | Age of respondents in years | 38.94 | | 12.85 | 18 | 90 |
| Female | This binary variable that takes value of 1 if a respondent is female, otherwise it takes value of 0. | | 63% | 0.006 | 0 | 1 |
| University | This binary variable that takes a value of 1 if a respondent received university education, otherwise it takes value of 0. | | 18% | 0.005 | 0 | 1 |
| Middle wealth | This is a binary variable for the household's social status. It takes value of 1 if a household is a middle wealth household, otherwise it takes value of 0. | | 34% | 0.006 | 0 | 1 |
| Wealthiest | This binary takes value of 1 if a household is a wealthiest household, otherwise it takes a value of 0. | | 37% | 0.006 | 0 | 1 |
| Country dummies | Country-level fixed effects | | | | 0 | 1 |
| Cluster dummies | Cluster-level fixed effects | | | | 0 | 1 |
| Impact variable | | | | | | |
| Paid OOP | This binary variable takes value of 1 if a respondent paid an unofficial out-of-pocket payment or made a gift while interacting with public school officials during last 12 months; otherwise it takes a value of 0. | | 17% | 0.004 | 0 | 1 |
| Instrument | | | | | | |
| Asked to pay | This binary variable that takes a value of 1 if a respondent was asked to pay an unofficial out-of-pocket payment or made a gift while interacting with public school officials during the last 12 months. It takes value of 0 if a respondent paid for other reasons or did not pay OOP at all. | | 4.60% | 0.002 | 0 | 1 |

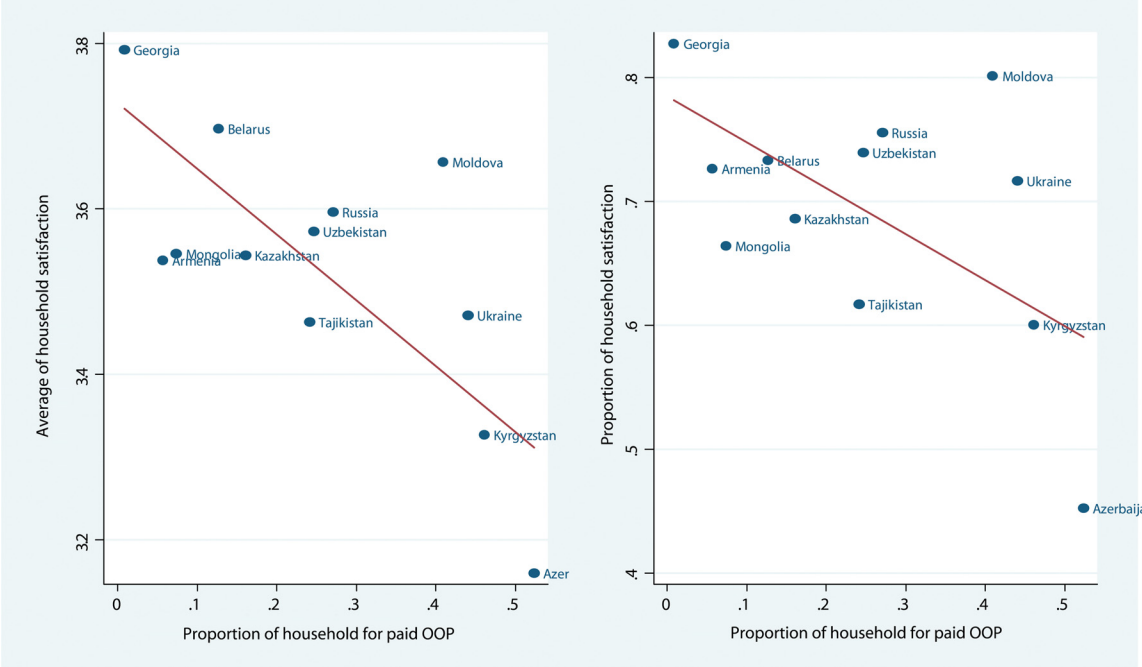


**Fig. 1.** Household satisfaction regarding primary education services versus proportion of people who paid OOP.

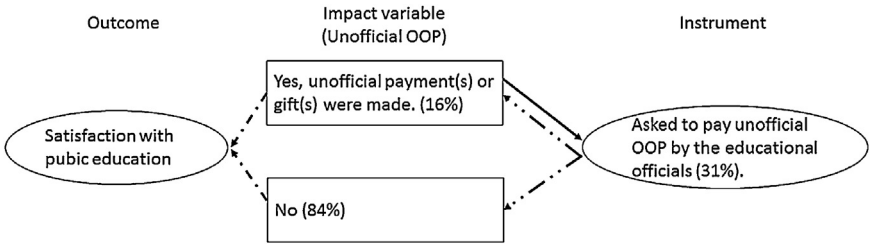


**Fig. 2.** Illustration of the relationship of the instrument, the predictor, and the outcome variables.

asking the respondent to pay OOP based on their assessment of respondent's level of satisfaction.

On the other hand, the decision to ask for an OOP is also unlikely to affect satisfaction directly. As demonstrated by a solid line in Fig. 2, all respondents (31%) who had been asked to pay OOP by the educational officials actually did it. Hence, the effect of paying OOP as a result of a request from educational officials is fully captured by the predictor. As shown by the dotted lines, this effect goes from the instrument to the predictor (answer "Yes") and then to the outcome variable "Satisfaction." If the respondent had been asked, but refused to pay, then no incident of OOP would have been recorded. The possible change in satisfaction due to being asked to pay OOP, but refusing to do so is captured by the predictor and included within the 84% of respondents who did not pay OOP (answer "No").

To empirically support the above-discussed arguments about the lack of a strong correlation between the instrument and the outcome variable, we conducted a test on correlation between "Asked to pay unofficial OOP" and "Satisfaction." The result of the test ($r = -0.17$) suggests that the correlation is negligible and that the instrument is not directly related to the outcome variable (Mukaka, 2012). Thus, both theoretical reasoning and the empirical test suggest that the instrument is not correlated with the outcome, other than through the impact variable.

Let us continue with the second postulate that the instrument, "Asked to pay unofficial OOP" is strongly correlated with the impact variable. To empirically test this assumption, we use several tests, as reported in Table 2. First, as we expected, our instrument is positively and strongly correlated with the predictor, paying OOP, in the first stage regressions in all models. Second, a significant value for the estimated robust $F$ statistics is always greater than 10, indicating that our instrument is valid (Cameron and Trivedi, 2010). Third, the minimum eigenvalue statistics are larger than Stock and Yogo's critical value (Stock and Yogo, 2005), confirming the argument that our instrument is not weakly correlated with the predcitor. Although these tests are not especially designed to test non-linear models such us biprobit, the estimation of these tests is still highly recommended (Nichols, 2007).

Finally, we test the assumption that instrumental variable models should be preferred over single-stage regressions. For IV, we perform an endogeneity test robust score Chi-sq and robust regression $F$ statistics (Wooldridge, 1995). A significant result for these tests indicates that OLS estimation is biased and that IV should be estimated instead. For biprobit, we perform the Wald test of endogeneity. A significant result of the test signals that single-stage probit estimation is biased, and thus biprobit should be estimated instead (Knapp and Seaks, 1998).

### 2.4. Covariates

First of all, we control for the quality of education. LITS asked a battery of five questions related to the problems that respondents might have encountered during past 12 months: (1) "No textbooks or other supplies that should be provided free of charge", (2) "Poor teaching", (3) "Frequent and unjustified absence of teachers", (4) "Overcrowded classrooms", (5) "Facilities in poor condition". Only binomial responses are allowed (the problem exists = 1, otherwise = 0). Using these binomial responses, we created a summative index of educational quality that varies from 0 to 5. The higher value of the index indicates less of a problem and, hence, higher quality.

We use the university education of the respondents and the wealth status of their households as controls for socio-economic status. The impact of socio-economic status cannot be known in advance (Lewis and Pattinasarany, 2009). On the one hand, higher socio-economic status may be associated with higher levels of satisfaction if individuals with higher education and more wealth have access to better education delivery and outcomes, and therefore are more satisfied. On the other hand, socio-economic status may be associated with lower levels of satisfaction if individuals with higher education and more wealth have higher expectations of education delivery and outcomes, which then exceed actual performance.

We also control for the influence of socio-demographic characteristics by the gender and age of the respondent (Harmel and Yeh, 2011; Lewis and Pattinasarany, 2009). Finally, we include dummy variables for countries and clusters to capture unobserved characteristics at the country and cluster level that may potentially affect the results of our estimations.

## 3. Results

The results of a single stage linear OLS and a single-stage biprobit that do not address endogeneity are reported in Table 2. The OLS coefficients are reported in the first column of the table, while the marginal effects of probit are reported in the second column. OOP has a significant and negative impact on satisfaction in both models. As shown by the OLS coefficients, paying OOP leads to a reduction in satisfaction by a factor of −0.38. Likewise, as shown by the probit marginal effects, OOP reduces satisfaction by by 17 percentage points. Among covariates, OLS suggests that an increase in educational quality is associated with an increase in satisfaction by a factor of 0.22. Equally, the IV regression suggests that an increase in educational quality is associated with an increase in satisfaction by percentage points. All other covariates are not significant.

The results of the main stage of IV and biprobit models are reported in the last two columns of Panel A in Table 2, while the first stages of the models are reported in Panel B. Again, OOP leads to a negative and significant impact on satisfaction. After having addressed endogeneity, the IV model suggests that OOP leads to a reduction in satisfaction by a factor of −0.98. In the same way, the biprobit model suggests that OOP reduces satisfaction by percentage points, after having addressed endogeneity.

Much like the single stage model, the instrumental variable model suggests that the only covariate whose impact is significant is educational quality. Thus, IV indicates that an increase in

**Table 2**
Results of regression analysis.

| | Single-stage models | | Instrumental variable models | |
|---|---|---|---|---|
| | OLS | Probit | IV | Biprobit |
| | Regression coefficients | Marginal effects | Regression coefficients | Marginal effects |
| *Panel A: Results of main models* | | | | |
| Paid OOP | −0.388*** | −0.175*** | −0.987*** | −0.287*** |
| | (0.041) | (0.020) | (0.102) | (0.028) |
| Quality of education | 0.224*** | 0.109*** | 0.176*** | 0.078*** |
| | (0.017) | (0.008) | (0.018) | (0.007) |
| Age | −0.000 | 0.000 | −0.001 | 0.000 |
| | (0.001) | (0.001) | (0.001) | (0.001) |
| Women | 0.004 | 0.004 | 0.005 | 0.004 |
| | (0.030) | (0.017) | (0.031) | (0.014) |
| University | −0.028 | −0.009 | −0.010 | −0.003 |
| | (0.036) | (0.020) | (0.037) | (0.017) |
| Middle wealth households | −0.053 | −0.023 | −0.055 | −0.020 |
| | (0.035) | (0.021) | (0.036) | (0.017) |
| Wealthiest households | −0.026 | −0.016 | −0.016 | −0.011 |
| | (0.035) | (0.021) | (0.036) | (0.017) |
| Country dummies included | Yes | Yes | Yes | Yes |
| Community dummies included | Yes | Yes | Yes | Yes |
| Number of observations | 3598 | 3576 | 3598 | 3598 |
| F statistics | 9.12*** | | | |
| Wald chi2 | | 611.07*** | 850.9*** | 7008.92*** |
| First-stage regression summary statistics | | | | |
| Robust F | | | 2036.37*** | |
| Minimum eigenvalue statistic | | | 892.07*** | |
| Stock and Yogo's critical value | | | 16.38 | |
| Tests of endogeneity | | | | |
| Robust score Chi2 | | | 43.60*** | |
| Robust regression F | | | 46.18*** | |
| Wald test of rho = 0 | | | | |
| Chi2 statistic | | | | 24.49*** |
| Panel B: Result of first-stage of 2SLS and bivariate probit | | | | |
| Ask to pay | | | 0.689*** | 2.092*** |
| | | | (0.015) | (0.076) |
| Quality of education | | | −0.055*** | −0.044*** |
| | | | (0.007) | (0.005) |
| Age | | | −0.001* | −0.001** |
| | | | (0.000) | (0.000) |
| Women | | | −0.001 | −0.001 |
| | | | (0.012) | (0.012) |
| University | | | 0.032* | 0.028* |
| | | | (0.015) | (0.014) |
| Middle wealth households | | | 0.009 | 0.006 |
| | | | (0.015) | (0.015) |
| Wealthiest households | | | 0.017 | 0.019 |
| | | | (0.015) | (0.014) |
| Country dummies included | | | Yes | Yes |
| Cluster dummies included | | | Yes | Yes |
| Number of observations | | | 3598 | |
| F statistics | | | 120.85*** | |

*Note*: Robust standard errors are in parentheses.

educational quality is associated with an increase in satisfaction by a factor of 0.17, while bivariate probit indicates that an increase in educational quality is associated with an increase in satisfaction by 7% points. Other covariates are not significant.

By comparing the results of the single-stage and IV models, we can conclude that the results of single-stage models underestimated the impact of OOP on education. Thus, the impact of OOP estimated by IV is 2.5 times larger than the impact estimated by

**Table 3**
Simulated IV and biprobit results.

| | IV | Biprobit |
|---|---|---|
| Everyone paid OOP | 2.791 | 0.433 |
| | [2.781, 2.799] | [0.424, 0.435] |
| No one paid OOP | 3.778 | 0.772 |
| | [3.768, 3.787] | [0.766, 0.775] |

*Note*: 95% confidence interval is given in bracket.

**Table 4**
Results of interaction models.

| | OLS | IV |
|---|---|---|
| Panel A: Results of main stage | | |
| Paid OOP | −3.408*** | −3.393*** |
| | (0.042) | (0.051) |
| Paid OOP × quality of education (interaction term) | 0.949*** | 0.957*** |
| | (0.009) | (0.013) |
| Quality of education | 0.142*** | 0.144*** |
| | (0.014) | (0.014) |
| Age | −0.000 | −0.000 |
| | (0.001) | (0.001) |
| Women | −0.019 | −0.019 |
| | (0.024) | (0.023) |
| University | −0.018 | −0.019 |
| | (0.029) | (0.029) |
| Middle wealth households | −0.001 | −0.000 |
| | (0.028) | (0.027) |
| Wealthiest households | 0.009 | 0.008 |
| | (0.028) | (0.027) |
| Country dummies included | Yes | Yes |
| Community dummies included | Yes | Yes |
| Number of observations | Yes | Yes |
| Wald chi2 | | 3598 |
| First-stage regression summary statistics | | 15016.31*** |
| Robust F for paid OOP in primary and secondary school | | 1030.72*** |
| Robust F for paid OOP in primary and secondary school × quality of education | | 1389.64*** |
| Minimum eigenvalue statistic | | 348.689 |
| Stock and Yogo's critical value | | 7.03 |
| Tests of endogeneity | | |
| Robust score Chi2 | | 2.30 |
| Robust regression F | | 1.12 |
| Panel B: Result of first-stage of 2SLS (paid OOP in primary and secondary school) | | |
| Ask to pay | | −0.998*** |
| | | (0.084) |
| Ask to pay × quality of education | | 1.014*** |
| | | (0.026) |
| Quality of education | | −0.128*** |
| | | (0.021) |
| Age | | −0.004* |
| | | (0.002) |
| Women | | 0.031 |
| | | (0.044) |
| University | | 0.084 |
| | | (0.052) |
| Middle wealth households | | −0.021 |
| | | (0.053) |
| Wealthiest households | | 0.036 |
| | | (0.053) |
| Country dummies included | | Yes |
| Cluster dummies included | | Yes |
| Number of observations | | 3598 |
| F statistics | | 111.32*** |
| Panel C: Result of first-stage of 2SLS (paid OPP in primary and secondary school × quality of education) | | |
| Asked to pay | | 0.653*** |
| | | (0.028) |
| Asked to pay × quality of education | | 0.014 |
| | | (0.008) |
| Quality of education | | −0.056*** |
| | | (0.007) |
| Age | | −0.001* |
| | | (0.000) |

**Table4** (*Continued*)

| | OLS | IV |
|---|---|---|
| Women | | −0.001<br>(0.012) |
| University | | 0.032*<br>(0.015) |
| Middle wealth households | | 0.009<br>(0.015) |
| Wealthiest households | | 0.017<br>(0.015) |
| Country dummies included | | Yes |
| Cluster dummies included | | Yes |
| Number of observations | | 3598 |
| F statistics | | 120.37*** |

*Note*: Robust standard errors are in parentheses.

OLS. Similarly, the marginal effect estimated by bivariate probit is 1.6 times larger than the impact estimated by single-stage probit.

An alternative way to evaluate the impact of OOP is to predict the average satisfaction with education for every individual in the sample depending on their levels of OOP through a simulation based on the results IV and biprobit results. The results of the simulations for IV are reported in the first column of Table 3. If every respondent had paid OOP, then the average level of satisfaction with education would drop to 2.79. Conversely, if no respondent had paid OOP, then the average satisfaction of with the education service would exceed 3.77. The results of the simulations for biprobit are reported in the last column of Table 3 and reveal the same pattern. If every respondent had paid OOP, then the probability of their being satisfied would decline to 43% points. In contrast, if no respondent had paid OOP, then the probability of being satisfied would surpass 77% points.

The final step in our analysis is to estimate the OLS and IV models with the interaction terms "paid OOP × quality of education ". The results are reported in the Panel A of Table 4. In both models, increases in paid for OOP significantly weaken satisfaction with the factors by −3.40 and −3.39 respectively, while improvement in quality has an opposite impact with a factor of 0.14.

The interaction term 'paid OOP × quality of education' has a positive impact with respect to both models by significantly strengthening satisfaction by the factors of 0.94 and 0.95. It must be highlighted that the tests for endogeneity failed to confirm that IV should be preferred over the OLS. Hence, OLS results should be used instead of IV results. To facilitate the interpretation of the marginal effects of the interaction terms, we plot the OLS results of the impact of paid OOP against the quality of education in Fig. 3, as recommended by Brambor et al. (2006).

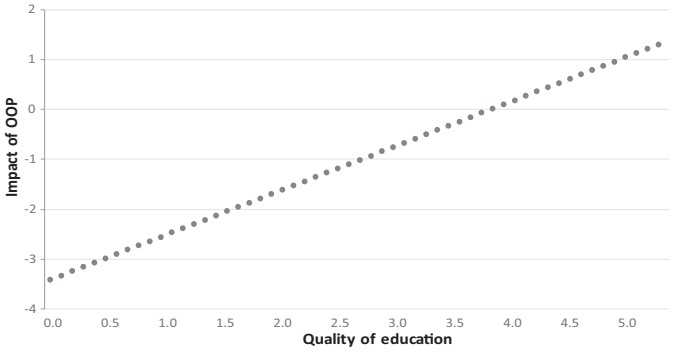


**Fig. 3.** Impact of OOP versus quality of education.

As illustrated by the trend in Fig. 3, the negative impact of OOP weakens, and eventually becomes positive. Therefore, the negative impact of OOP is lower in environments where the quality of education is higher. In contrast, when quality of education is low, then the negative impact of OOP increases considerably.

Since we estimated a model with interaction terms, we have two first-stages. The first stage "paid OOP in primary and secondary school" is reported in Panel B of Table 4, while the first stage that corresponds to the "paid OOP in primary and secondary school × quality of education" is reported in Panel C.

## 4. Limitations

Several key limitations should also be highlighted. First, we cannot distinguish between outright corruption and OOP taken to improve education (e.g. class refurbishment) due to the limitations of the data. Likewise, we cannot distinguish between recipients of OOP (e.g. teachers versus principals). Second, OOP is viewed only from the perspective of users, and the opinions of teachers, students, educational managers, and politicians cannot not be taken into account. Similarly, the data allows us to focus only on petty corruption, rather than on large scale educational OOP. Third, the results of the instrumental variable estimations are as good as the instrument is. Although theoretical reasoning and empirical tests suggest that the instrument is not directly correlated with the outcome, such a direct effect cannot be completely ruled out.

## 5. Conclusion

In this study, we explore the "sand-the-wheel" and "grease-the-wheel" perspectives regarding the impact of OOP on citizens' satisfaction with primary and secondary education in Post-Soviet countries. We apply single stage and IV models on a cross-sectional sample of a comparative survey conducted in 11 countries of the former Soviet Union and Mongolia.

The results of single stage linear and probit models support the "sand-the-wheel" perspective and reject the "grease-the-wheel" perspective. OOP has a significant negative impact on citizens' satisfaction with primary and secondary education in all single-stage models. We use the instrumental variable technique to address endogeneity biases that encompass reverse causality and the omitted variable problem. The results of IV and biprobit estimations indicate that the impact of OOP on satisfaction remains significant and negative after addressing endogeneity. These findings confirm support for the "sand-the-wheel" perspective over the "grease-the-wheel" perspective. These findings also suggest that more efforts need to be made to reduce corruption in FSU countries. One possible way to reduce the OOP in education

would be to provide equal opportunity for every child to access schools (Heyneman, 2004). Another would be to increase transparency within school management, for instance, through conducting and analysing regular surveys on OOP in education (Heyneman, 2008). In addition, governments should increase educational budgets. Increased budgets could help reduce teachers' dependency on OOP and lessen the need for OOP for refurbishment, equipment, textbooks, class materials etc. (Heyneman, 2004).

At the same time, the interaction model demonstrates that the negative impact of OOP declines as quality of education is improves. Equally, when the quality of education deteriorates, then the negative impact of OOP strengthens considerably. This result appears to provide some support for the "grease-the-wheel" perspective. This result is also in line with the previous findings of Bratton (2007) and Lavallée et al. (2008). However, even in the interaction model, the impact of OOP on satisfaction with education remains negative. This finding suggests that the support for the "grease-the-wheel" perspective is rather weak when compared to the support for the "sand-the-wheel" perspective.

From a methodological standpoint, we found that single stage models (i.e. OLS and probit) considerably underestimate the true impact of corruption on satisfaction. The underestimation caused by endogeneity leads to reverse causality and omitted variable problems. Therefore, the results of cross-sectional studies that use single stage models to estimate the impact of corruption on satisfaction without addressing endogeneity may be misleading in terms of showing the true magnitude of the negative impacts of corruption on satisfaction with education. The actual magnitude of the OPP effect on satisfaction is likely to be higher than that which can be found without addressing endogeneity.

The results of this study provide impetus for future research in three main directions. First, regional and country effects of corruption could be studied in a more in-depth manner. It is conceivable to assume that regional and country particularities may play important roles in determining the impact of unofficial OOP on satisfaction with education. Second, it would be instructive to evaluate the characteristics related to the propensity of being a victim of OOP. Third, longitudinal studies may add value by focusing on the trend rather than on a snapshot of the impact of OOP on satisfaction.

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